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OF THE

USEFUL CABINET.

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ORIGIN OF ARTS.

(Continued from Page 24.)

OF the invention of colouring cotton with the oxyd of iron, no account is to be found when it was first discovered, nor by whom. It is a modern discovery, and in all probability, like many other useful arts, the effect of accident, from which the first idea of its utility was obtained. Mr. Chaptal, the celebrated chymist, says, "That the colour given by the oxyd of iron is very permanent; it not only resists air and water, but alkaline leys or soap, and gives a brilliancy without sensibly diminishing its intensity."

"On account of these properties, the oxyd of iron has become an essential ingredient in the art of dying, being considered as a colouring principle of the utmost value."

When or by whom the discovery of converting iron into steel by the process of cementation, was made, is not precisely known. It is however considered a modern discovery. As it may be of some importance at the present day for the public to know the European method of converting iron into steel, I shall subjoin the following extract taken from the Repertory of Arts and Sciences, printed in London Jan. 1st. 1799.

"This is performed by impregnating bars of iron with carbon, viz. charcoal, and is called cementation. The furnace for this purpose is a conical building of brick, in the middle of which are two troughs of brick or fire stone, which hold about four tons of bar iron. At the bottom is a large grate for the fire. A layer of charcoal dust is put upon the bottoms of the troughs, then a layer of bar iron; and so on alternately until the troughs are full. They are then covered over with a clay to keep out the air, which if admitted would prevent the cementation. The fire is then communicated to the wood and coal with which the furnace is filled and continued until the conversion of the iron into steel is completed, which generally happens in about eight or ten days. This is known by the blisters on the bars, which the workmen occasionally draw out in order to determine.—

When the conversion is completed, the fire is then left to go out, and the bars remain in the furnace about eight days more to cool.

" The bars of steel are then taken out and either sold as blister steel, or drawn down to a convenient size, when it is called tilted steel. German steel is made out of this blister steel by breaking the bars into short pieces and welding them together, drawing them down—doubling and welding—and drawing them down to a proper size for use."

" Cast steel, (which is quite a late and important improvement) is made from the common blister steel. The bars are broken into very short pieces, and put into large crucibles with a flux of antimony. The crucible is then closed up with a lid of the same ware, and placed in a wind furnace. By the introduction of a greater or smaller quantity of flux the steel is made of a harder or softer quality.

This flux separates the impurities, dissipates the iron qualities, and renders the texture of the steel uniform, fine, and adhesive. When the fusion is complete, the metal is cast into ingots and then drawn down to a proper size for use."

" *Sweeds* iron is commonly used for this purpose."

The conversion of iron into blister steel, and of blister steel into cast steel might be performed to a great advantage in this country. These are articles of the first importance to Agriculture, commerce, and manufactures. It would therefore be well for government to encourage a manufacture of this kind, which if properly managed would undoubtedly yield forty or fifty per cent profit.

The superiority of edge tools made of cast steel is too well known to need any recommendation—The art of welding the best kind of cast steel to iron, without injuring its texture, is an American discovery. Mr. Daniel Pettibone of Roxbury, Massachusetts is the inventor, for which he has a Patent dated March, 1806. This is a valuable invention, as the tools made of cast steel welded to iron, by his process, sufficiently prove.

Altho' we have tools imported from England, which are said to be cast steel welded to iron, yet according to the account of Sir T. Frankland communicated in 1795 to the Royal Society of London, it appears, " that the cast steel which they weld to iron is a soft kind, little better if any than common steel." For he says, " that the heat which they find necessary to weld their cast steel, would either melt the best kind," (such as Mr. Pettibone uses) " or render it unable to bear the hammer; in which case the goodness of the steel would be wholly ruined." So that Mr. Pettibone's discovery may be justly considered a great

and valuable improvement in extending the use of the best cast steel to those tools, which require a part of them to be of iron; and this too without the least injury to the goodness of the steel, which it possesses before it is welded. His process is simple, not expensive, and easy to be understood. Edge tool makers will find it advantageous to them to obtain of him a right to use this valuable art.

The first account we have of a ship with sails, is that with which Danaus an Egyptian, according to Herodotus, sailed from Egypt into Greece in 1485 B. C. Whether he was the inventor of it or not history does not say. Not long after this period the Phoenicians became famous in navigation. Their principal cities were Tyre and Sidon situated upon the eastern shores of of the Mediteranean. To them is attributed the invention of many of those useful arts, with which they were enabled to excel all other nations of that age in commerce and manufactures.—Their vessels were small, constructed with sails and oars, and required a great number of hands to navigate them. Nowithstanding they performed long voyages and returned richly laden. For the purpose of commerce they established colonies in different countries. Their ships were seen upon every coast of the then known world; and by the exchange of the articles of their own manufacture with different nations and receiving in payment raw materials, they not only acquired immense riches, but the love and veneration of those people, among whom they introduced the comforts, conveniences, and the ornaments of life. Their manufactures, the *hand-maids* of commerce, were so far superior to those of other nations, that whatever was elegant, great, or pleasing either in apparel or in domestic furniture, received the appellation of *Sidonian*. Success and applause gave energy to their enterprise and inventions; and for many centuries they remained a rich, powerful, free and happy people, in the full enjoyment of the unlimited commerce of the world, dispensing the blessings of life to millions of their fellow beings.

King Solomon profited by their example, and engaged large companies of Phoenician ship-builders and seamen, by which means he soon rendered his kingdom the glory and admiration of the world. He had ships built upon the shores of the Red sea of such dimensions and strength as to be capable of performing a three-years voyage in exploring the Indian and African coasts.

By commercial enterprise connected with their manufactures these two kingdoms acquired such massy wealth as to allure those indolent nations, who made war their chief profession, to destroy them for their wealth, and ruin the improvements of a

thousand years made in civilization and human happiness, by the united genius, industry, and enterprise of a great and generous people.

As a commercial people, much celebrated for the number and excellence of their ships, the Carthagenians next claim attention. Their principal city, situated about 10 miles from Tunis, was founded by Dido 869 years B. C. or as some authors say long before that time. Their vessels were like the Tyrians', constructed with sails and oars; but of such dimensions as sometimes to require one hundred men to navigate them. They drew but little water, and of course must have been long and very broad. Those intended for long voyages, were sheathed and strengthened with copper. Whether this improvement for securing vessels was their invention or not, is uncertain; as according to Virgil the bow of the ship, with which Æneas escaped from the destruction of Troy 1184 years B. C. was sheathed with brass.

It appears however that the Carthagenians knew the value of this improvement. Besides the shores of the Mediteranean, they frequented those of England and Europe in general, from which they obtained raw materials of great value. They discovered the Canary Islands, by them called the "Fortunate Islands," on the coast of Africa. And it is related by Hanno one of their most enterprising navigators, that he sailed down the Red Sea, doubled the cape of Good Hope, and returned by the straits of Gibraltar to Carthage. Such was their enterprise in commerce and manufactures, particularly in the building of ships, that they became the richest and most powerful nation of their day.—Their city was 23 miles in circumference, containing 700,000 inhabitants; and owed its grandieur, *not to the plunder of other nations*, but to the industry and genius of its citizens in commerce and manufactures. And while they enriched themselves by feeding and clothing millions of their fellow creatures, and by extending the blessings of civil life to the barbarians of that age; the Romans, who had adorned their capital with the *spoils of fallen nations*, from a malignant spirit of envy became jealous of the naval ships of Carthage—and that Cato, whom historians have extolled as a true patriot, and who often declared that "the only profession worthy of the Romans was war and arms," in pronouncing this sentence, "Delenda est Carthago," that *Carthage must be destroyed*, did not foresee that he was at the same time dooming his own country to the same fate.

Scipio, the Roman General who in 147 B. C. conquered and totally demolished this splendid city, while viewing its ruins,

wept at the idea of having destroyed a city, which exhibited such monuments of human wisdom and industry, and which had nourished millions of the human race with her commerce.

Rome too much addicted to war, never made much progress in commerce, nor many improvements in manufactures. For want of proper attention to *these arts* of peace in order to preserve the industry of her citizens, she fell a miserable victim to her own corrupted unwieldy power.

After the fall of the Roman power, about the middle of the sixth century A. C. Venice, Florence, Genoa and Pisa, each in their turn, became celebrated for their extensive commerce, and for their improvements in ship-building and manufactures in general. But the most material improvements in the building of ships, and consequently the extension of commerce, have taken place since the invention of the mariner's compass; under which article further observations concerning the present subject will be made.

According to history the invention of that useful instrument, the saw, is ascribed to Talus a young Athenian, who flourished about 1230 year B. C. In consequence of the honors his country confered upon him for this valuable discovery, Dædalus, his uncle a celebrated artist, became jealous of his rising fame, and privately put him to death. Sensible of the advantage derived from this invention, his countrymen recorded his name in their histories as a real benefactor.

Since which time this tool has been justly considered one of the most useful and important instruments in mechanical operations. Those manufactured at the present day by the English are held in high estimation.

Mr. Waters of Sutton in the County of Worcester, Massachusetts—has lately established a manufacture of large mill-saws, which are said to be superior to those of the English. The improvement he has introduced is, to have the middle of the saw of iron and the outsides steel, which renders it easier to be filed, and less liable to break. These are important qualities in a mill-saw. His undertaking a manufacture of this important tool is laudable, and deserves the patronage of his country.

The invention of coining gold and silver money is attributed to the Greeks of Argos in 894 B. C. The advantage of this *article* even to the little commerce of that day was undoubtedly very great. Its introduction soon became general among several nations, particularly the Tyrians, Corinthians, and the Carthagenians, to whom it gave a stimulus in commercial pursuits, in order to the acquisition of this most commanding representative of all their wants. Before this invention gold and silver

were used inpayment according to their weight and value ; the inconveniency of which must have been very great in small transactions. In 266 B. C. the coinage of silver was introduced at Rome. Before this time brass money was the only coin in use among the Romans, which is another proof of the little attention they paid to commerce. In 628 A. C. gold and silver were coined in France ; and silver about the same time was coined in England ; but gold was not until about the middle of the fourteenth century. At the present day the coinage of the United States of America, stamped with *insignia* emblematical of the freedom of a brave and generous people, is unquestionably the most elegant ever known ; and is a credit to the country whose genius and independence it expresses.

Under this head it may be proper to introduce the invention of other mediums of exchange, which at the present day have a greater circulation and tend more to facilitate commercial transactions than specie. These are Bank notes and bills of exchange, which, containing no intrinsic value, have obtained an universal currency wholly predicated upon the credit, good faith and honor of banks and merchants.

The first national Bank was established at Venice, A. D. 1157, by a number of eminent merchants, who, having assisted their government with large sums of money, obtained their faith in return, as a pledge for the redemption of their notes, which gave them a currency equal to specie. The advantages the Venetians derived from this institution induced other nations to follow their example. St. George's Bank was established at Genoa, A. D. 1407, to which that Republic was greatly indebted for pecuniary assistance in maintaining her rights. The Bank of England, incorporated A. D. 1694, contains the largest capital, and possesses the most extensive and permanent credit of any Bank in the known world. The policy of that government has been to give a national credit to this institution, the good effects of which are clearly illustrated by the currency of their bills and by the extension of their commerce.

In point of credit the United States Bank of America next claims attention. This was incorporated in 1791, with a capital of 10 millions of dollars. Branches of this Bank, for the purposes of discount and deposit only, have been established in several of the large commercial cities. The advantages of this Bank, as it respects public credit and commerce, have been already experienced. Numerous commercial Banks besides this have been incorporated by the Legislatures of the several States, partaking of a private nature, not having the faith of government to assist their credit. The rage of speculation in multiply-

ing these private institutions, (which are no doubt beneficial if kept within proper bounds) has increased to an alarming extent.

Next to bank notes, as facilities in commercial dealing, may be ranked bills of exchange. The invention of these belongs to the Jews, who being driven from England and France, where by speculation they had acquired great wealth, toward the end of the thirteenth century retired to Lombardy, from whence they wrote private lettters to those persons with whom they confidentially entrusted their property, requesting them to pay a certain sum of money to the person, or his order named, of whom they had received the value; which were faithfully complied with. So that from the cruelties practised upon the Jews, have originated one of the most convenient mediums of commercial intercourse, by which large sums may be remitted with greatest ease and safety to any foreign country, or distant place.

(To be continued.)

FOR THE USEFUL CABINET.

QUESTIONS ANSWERED.

MESSRS. EDITORS,

IF no better solution shall be communicated, the following answer to the questions in your last number under the head of Mathematics, submitted to your consideration by a reader of the Useful Cabinet.

H. W.

A line can be drawn within the angle B. A. C. (see figure page 21,) at right angles to a bisecting line and terminating in the sides or legs of the angle.

MECHANICALLY.

1st. By a rule, measure on the leg A. B. to a point which note, then the same measure on the leg A. C. to a point, then draw a line from one point to the other, which will be at right angles with a bisecting line.

2d. Or by a square thus, measure equal distances from the angle A. on each of the legs, then place the long arm of the square along the leg A. B. with the angle of the square at the point noted and the short arm of the square turned within the legs of the angle, draw an indefinite line by the arm of the square from the point noted; then reverse the square to the

other leg of the angle, placing the angle of the square at the point noted in the line A. C. with the long arm of the square along the line A. C. and the short arm of the square turned inward, draw a line by the arm of the square from the point marked in the line A. C. till it intersects the indefinite line drawn from the other leg—from the point of intersection draw a line to the angular point A. which will bisect the angle—draw a line from the point marked in the leg A. B. to the point marked in the leg A. C. and it will be at right angles with the bisecting line.

3d. By the dividers, with one leg in the angular point A. draw a circle cutting both the legs of the angle, from the points where the circle intersects the legs, draw a line to connect those points by a rule, from the points in the legs with the same radius draw circles to intersect each other within the legs B. and C. from the point of intersection of the circles draw a line to the angular point A. which will bisect the angle, and will be at right angles with the connecting line terminating in the sides of the angle.

2d Question—MECHANICALLY.

The bisecting line being formed by the square as above directed, with the long arm of the square on the bisecting line draw a line at right angles with the bisecting line and extend it each way from the bisecting line equal to half the given line, at some other place on the bisecting line draw another line at right angles with the bisecting line extending on each side as above equal to half the given line, through the ends of these lines draw parallels to the bisecting line and continue them to the legs of the angle B. A. C. and from those points where the parallels intersect the legs of the angle, draw the line which will be equal to the given line and at right angles with the line drawn from its centre to the angle A. which is the bisecting line which was required to be done.

2d. By the dividers, bisect the given angle, then draw a parallel to the bisecting line, on each side thereof at the distance of half the given line, draw parallels to the bisecting line and produce the parallels till they intersect the legs of the angle, draw a right line from one of the points where the parallel cuts the leg of the angle to the other point where the other parallel cuts the other leg of the angle, and that line will be the line required.

These several methods of performing, are thus particularized, with a view to draw the attention to such instruments as may

be used by Geometricians, to produce figures to the eye, on the properties of which they are about to reason; on which subject some further considerations will be submitted.

1st Answer—GEOMETRICALLY.

This proposition is evident to any Geometrician, depending on some of the first principles in Euclid, as without any figure we may conceive an angle, with a line drawn across terminating in the sides or legs in points equidistant from the angular point; and we can imagine a bisecting line to extend from the line terminating in the legs and producing two triangles which will be right angled triangles; which may be demonstrated as follows, viz. let A. be the angular point, B. and C. points in the legs at equal distance, so that A. B. and A. C. are equal, a line from B. to C. forms an isoceles triangle; bisect the angle A. by a line extending from the angular point A. to the line B. C. as at d. which will form two triangles; then as all the angles of a triangle are equal to two right angles, and as the angles d. B. A. and d. A. B. are equal to d. C. A. and d. A. C. it will follow that the angles A. d. B. and A. d. C. are equal one to the other and consequently right angles.

2d. Prop.

By either of the constructions under the head of "2d Question Mechanically" a diagram will be produced, which geometricians will admit may be constructed, and clearly conceived.

DEMONSTRATION.

Let A. be the angular point, B. and C. the points where the parallels intersect the legs of the angle which will be equidistant from the angle A. the line B. C. being drawn will be a line equal to the given line and at right angles to the bisecting line, let d. be the point where B. C. intersects the bisecting line, by construction, d. B. is equal to d. C. equal to half the given line D. E. and at right angles with the bisecting line d. A. therefore B. C. is equal to D. E. and at right angles, &c.

This proposition may be useful to Surveyors, Architects, and Engineers; for example an Architect wishes to cut the corner of a block where two streets converge to one, to a given length of front so as to face the angular point, by this method he can perform it by the help of his square.

The tools used by architects and master-workmen as instruments to lay out their work, and the mathematical instruments used by Geometers to draw diagrams by which to aid the memory and strengthen the imagination in support of the reasoning to produce the demonstration desired, may be considered as mechanical; and that diagram will be the most perfect representa-

tion of the idea to be conveyed, which is performed by the best instruments most correctly used. The compasses of the carpenter is an instrument of iron, the dividers in the mathematical case, part iron and part brass, in which is also a rule made of box or ivory, liable to warp, yet these only are admitted to be used in mathematical figures; i. e. postulata are demanded, to accomplish which these instruments are resorted to—To bisect an angle various movements of the dividers (an instrument of two parts, joined at one end over a pivot, liable by continual friction to become loose and uncertain) are made to obtain points, and after that the rule is used to draw the line from the point of intersection to the angle; the carpenter uses his square made of iron, (an instrnment in one body not depending on a joint) for a rule as well as a square, and by this instrument can perform the proposition, which in the other case requires two instruments. It has never been demonstrated that the sides of a square may not be made as truly right lines, as those of a rule, nor that a man cannot make a right angle in metal as true as in wood or paper.

A good iron square should be made with the leg two feet long, three inches wide, the sides as nearly strait and parallel as possible, the arm correctly at right angles, and half the width, and half the length of the leg.

A mathematical case may contain a square made of brass (or if platina could be obtained and made malleable it might be the best metal for many mathematical instruments,) six inches long, one and an half wide, the arm three inches long and 3-4th wide, the parallels and right angles as correct as possible—the line of the inner side of the leg should be carried to the outer side of the arm and thus the arm would be bisected, and a double right angle produced; this instrument for various purposes of delineation would be very convenient, and it is believed would be as correct as the use of dividers and rule, and as expeditious.

The Method of making Cases of Paper, Leather, &c.

IF paper be used, it should be thick, even and of a strong texture; coarse brown paper will generally answer the purpose. This should be cut into strips of the size most convenient to the article intended to be cased. It must then be wetted as paper is for printing, with this difference, that gum water is to be used. After having laid one night in a warm situation, it becomes fit for use. It is then to be wrapped on molds, previously oiled, and every thickness, as it is folded on, is to be smeared with a paste of wheaten flour, strengthened by gum or glue. Each

fold should be pressed close as it is wrapped on. Many subjects require to be stiffened by bookbinders boards introduced between the first and second folds. Being dry, the parts must be fitted by a knife, and then varnished with Mastic varnish, colored with lamp-black. Finer paper of firm texture may be used to cover the shavings for partitions; and also when the case is to be covered with leather or shagreen; it should remain on the molds till perfectly dry.

The molds are to be made of hard wood, well smoothed and formed to draw out easily when the paper becomes dry. Many things, as parchment scabbards of swords, &c. may be formed on the instrument they are intended to cover. H.

FOR THE USEFUL CABINET.

CAUTIONS RESPECTING FIRE.

MESSRS. EDITORS,

OF life's casualties, a great part are produced, and a greater part aggravated by a want of forethought. Accidental fires may be ranked among the most distressing occurrences which appear in the catalogue of human calamities. That their recurrence may be rendered less frequent and their attendant evils mitigated, by exercising a reasonable degree of forethought, is a position requiring no demonstration. But the difficulty of making thoughtless people think, is an obstacle in the way of establishing previous arrangements for meeting conflagration. This difficulty may be greatly reduced, by placing in the view of children and domestics, and obliging them from time to time to read or hear, such observations as shall guard them from careless habits, and govern their conduct in a time of fire, which is to many persons a time of distraction; and the cause why it is such, originates in a neglect of previously rendering the subject familiar to the mind, by contemplating the most rational measures to be pursued on the most sudden alarm. With this design, many of the following observations were printed some years since, at the expence of a fire society in a neighbouring state, that each member might have them constantly in view of his family. With additions and improvements, they are now presented for publication in the Useful Cabinet. To be rendered serviceable to any extent, they should be re-printed on one side of a sheet, and suspended in some conspicuous part of every House, with a blank space left on every paper thus appropriated, in which such further remarks may be made by judicious heads of families, as may im-

prove the design, and render it in time, a complete collection of rational rules for preventing or subduing accidental fires ; and for reducing the multiplied evils of those which shall happened, in defiance of human forethought.

Observations to prevent fires arising from Carelesness.

1st. In erecting new buildings, it is presumed all wood work will be so guarded by the workmen, as to secure it from the possibility of fire being communicated in any ordinary way from the places for making fires.

2d. Every building, where fire is designed to be used, should be carefully examined by its occupants, and if dangerous places be discovered, they should be secured without delay. This caution is absolutely necessary in all old buildings, particularly such as have had their fire places reduced to smaller sizes ; in doing which it has been common to leave concealed under the wainscot a stick of timber originally inserted with the name of Mantle Tree. *A Tree abundantly fruitful in producing conflagrations.*

3d. The examination recommended in the foregoing article is essentially requisite while a chimney is burning, and should be continued for some hours after the fire is apparently extinguished, if the chimney be old, or not known to be completely secure.

4th. Destructive fires have perhaps originated from no *one* cause more frequently, than from hot ashes and embers being deposited in wooden vessels. If this were a *fineable* transgression by law, and housekeepers would complain of domestics who incur the fine, the evil might in a degree be prevented ; but reasoning or commanding will have no effect with those who cannot be taught that wood is a combustible substance. The only proper time for taking up ashes is in the morning.

5th The danger arising from lighted candles, their snuff and sparks, is much greater than is generally contemplated. Of this danger children and domestics should be frequently cautioned, and should be shewn by experiment at what distance, *above* a candle or lamp, any light combustible matter will catch the flame ; while the same article may be held very nigh the *side* of the blaze without injury. They should also be prohibited from carrying lighted candles or lamps into places containing light combustibles—from reading in bed, which is a common and very hazardous practice—from carelessness with the snuff of a candle—from leaving linen, cotton, &c. exposed to sparks from a candle either in drawers partly open, or strewed about —from playing with fire—from using a broom or brush among

embers, without an immediate search for fire therein, before it be put away. Finally, cautions respecting fire can scarcely be too frequently repeated, or too strongly enforced, among the young and the thougtless; nor can light combustibles be too carefully guarded from danger.

6th. On retiring for the night, it is safest to rake up but one fire in a family, the others being completely extinguished. The burnt sticks should be quenched and separated, that if a latent spark, should re-kindle any one in the night, it could not communicate fire to the others; and they should be laid flat on the hearth that the brands might not fall to scatter the coals. One or two pails of water should be ready in some known place to be instantly used if wanted. Care should also be taken to shut every door in the house, that the progress of a fire might be checked by confinement. Sufficient opening should be left in window-shutters for persons without to see the light, if a fire should commence within.

7th. Cats, Dogs, and even Rats and Mice will resort to the embers if permitted; and instances have been known of burning candles being carried by Rats into their holes. A live coal will adhere to the hair of an animal. The embers should therefore as much as possible be guarded from their visits, and a lighted candle should never be left under the care of Rats.

8th. Some persons are so afraid of fire, as to prohibit conversing upon it in a windy evening. The only rational mean of guarding in any measure against it, is to render the subject familiar in conversation, and thereby be prepared for preventing or meeting the evil.

Measures for Subduing a Fire.

1st. As there is a critical moment in the commencement of fire, when a small effort will stop its further progress, the delay of a few seconds may be attended with extensive injury. It is therefore wise to be prepared for short warning. For this purpose every article of cloathing should be so placed, when taken off, as to be instantly found in the dark. Some apparatus should be at hand for lighting the candle or lamp, which should have one stated place within reach, and be so extinguished as to be lighted without difficulty; and as the common extinguisher may at all times be obtained at a trifling expence, every family ought to be supplied with a number of them. In addition to fire-buckets and bags, which are generally provided, it would be expedient for every house to be furnished with a mop having a long handle for extinguishing sparks on the roof in a time of

neighbouring fire ; and every house ought to have a scuttle on the roof.

2d. Every well should be supplied with a pump or some other means, which may be depended on, for drawing water expeditiously; every pump should have the spear or rod so long, as that the upper box may play considerably below the platform, as a partial guard against frost ; and a box at least two feet high, should be made, so as nearly if not quite to surround the pump with a space on one side for drawing water with buckets, if the pump should fail. This box should have a cover to shut tight, with hinges ; and if the box surround the pump as high as its spout, the warm vapour arising from the water will generally operate as a complete security against freezing.

3d. A building on fire should be kept as close as possible.—When fire is discovered in an early stage in any lower room of a wooden building, a large auger-hole bored through the side, for admitting the engine pipe from a hose, would be far preferable to breaking down a door or window, especially if the laths and plastering be beat through by the auger, making a space large enough to give the pipe various directions.

The wasting of water is so common, that cautions respecting it cannot be too frequently repeated during a fire. Earth is extremely useful for extinguishing fire on a floor, and should be applied when it can.

4th. At all times of fire, presence of mind is equally important as a supply of water, yet many persons are thrown into a temporary state of distraction on the smallest alarm, and their fright encreases the evil. The following directions are therefore offered for subduing the fire of a foul chimney as being greatly preferable to screaming. Let the room be kept as close as possible, and the fire on the hearth suddenly be extinguished with a considerable quantity of water, that the steam may check the flame above, while the fire-place is closing, which should be done as expeditiously as possible, by placing before it a board sufficiently large to cover the space ; the apertures round the edges must then be closed with woolen or wet linen cloths, so as to prevent a passage for the air, keeping the board pressed hard up until the fire subsides. The common folding board is excellent for this purpose, if sufficiently large, if not a large table with its leaves spread and held upon the side, may be made to answer if properly attended to. When a fire place is thus closed, no current of air can pass upward to carry out a volume of blaze and cinders from the top, unless there be defects in the chimney, in which case the air admitted through the defect will continue to

support the flame within, although the fire place remains closed.

5th. Apparatus for subduing a fire, should always be in readiness, and some articles not now in use might advantageously be added thereto. Fires taking place by sparks from a distance, must commence in a small blaze, which a pint of water would extinguish but perhaps no instrument is at hand for conveying it to the spot, and the building must burn if the town engines are engaged in another quarter. These fires might be generally extinguished in the beginning, by the aid of a tin tube with a piston, made in the manner of a syringe, the expense of which would be trifling, and every family could afford to supply themselves. Hand-engines might also be made of the same material or of copper, for throwing a greater quantity of water, and so portable as to be carried by one person with ease to the chambers or the top of the house. With such an engine, having a bended pipe fixed to a short hose, the whole front of a house might be kept wet from the chamber windows. Such tin pumps as are now in use for washing windows are very convenient for this purpose—buildings near those on fire may be almost effectually guarded by having blankets, carpets or any large woolen cloths spread over them and kept constantly wet.

6th. One of the most effectual securities against fire would be the establishment (under the sanction of the town) of a *fire guard* (or any other appropriate appellation) to consist of a certain number of respectable men taken from every street—to be designated by a particular badge—whose duty it should be to visit and ascertain the state of all pumps and wells in their neighbourhood, to know the sources most convenient and most to be depended on in time of a neighbouring fire—to give notice to the proprietors of defective pumps and in case of their neglecting to repair them to complain to the fire wards—as likewise of all hazardous practices—such as depositing embers in wooden vessels—carrying lighted candles or lamps unguarded among hay or other light combustibles—slighty modes of guarding wood work in new buildings, &c. Likewise to be invested with power to form the first attendants at a fire into *lanes* for supplying the engines with water before the arrival of the fire-wards, and to assist them afterwards by giving them all the information in their possession with respect to the neighbouring places—to detect and prevent theft—to prevent a useless waste of water and to observe such as are particularly active in subduing a fire, that they may be honorably noticed.

Should the foregoing hints be thought worthy of notice we shall in a future number give further outlines for the organization of such a *guard*.

CORN SHELLING MACHINE.

THE machine for shelling Indian Corn of which we give a representation in the plate annexed was invented by PAUL PILSBURY, of *Newbury*, in the county of *Essex*, and commonwealth of *Massachusetts*, for which he obtained a Patent bearing date Oct. 25th, 1803, and afterwards sold his Right to the present proprietors, *viz.*—PAUL ADAMS, of *Newbury*, THOMAS BURNHAM, and JOSEPH LORD, of *Ipswich*, in said county—who in their deeds of sale to others give the following :—

"*Description of the Shelling Machine.*

"It consists of a wooden frame for the Cylinder to work in, 3 feet long and 2 feet 7 inches in height.

"A Cylinder 20 inches diameter and 15 inches length, of white oak set with small iron teeth to project out about $\frac{3}{8}$ of an inch, intersected within $\frac{7}{8}$ of an inch of each other to shell the corn with as the Cyllinder turns round.

"A Gudgeon passing through the centre of the Cylinder for it to turn on, made of wood or iron.

"A Crank to turn the Cylinder with, made with wood or iron.

"A semi-circular bottom, under the Cylinder, made with wooden slats, set with small iron teeth, intersected like those in the Cylinder; the slats placed so far apart as to let the shelled corn fall through into the receiver below.

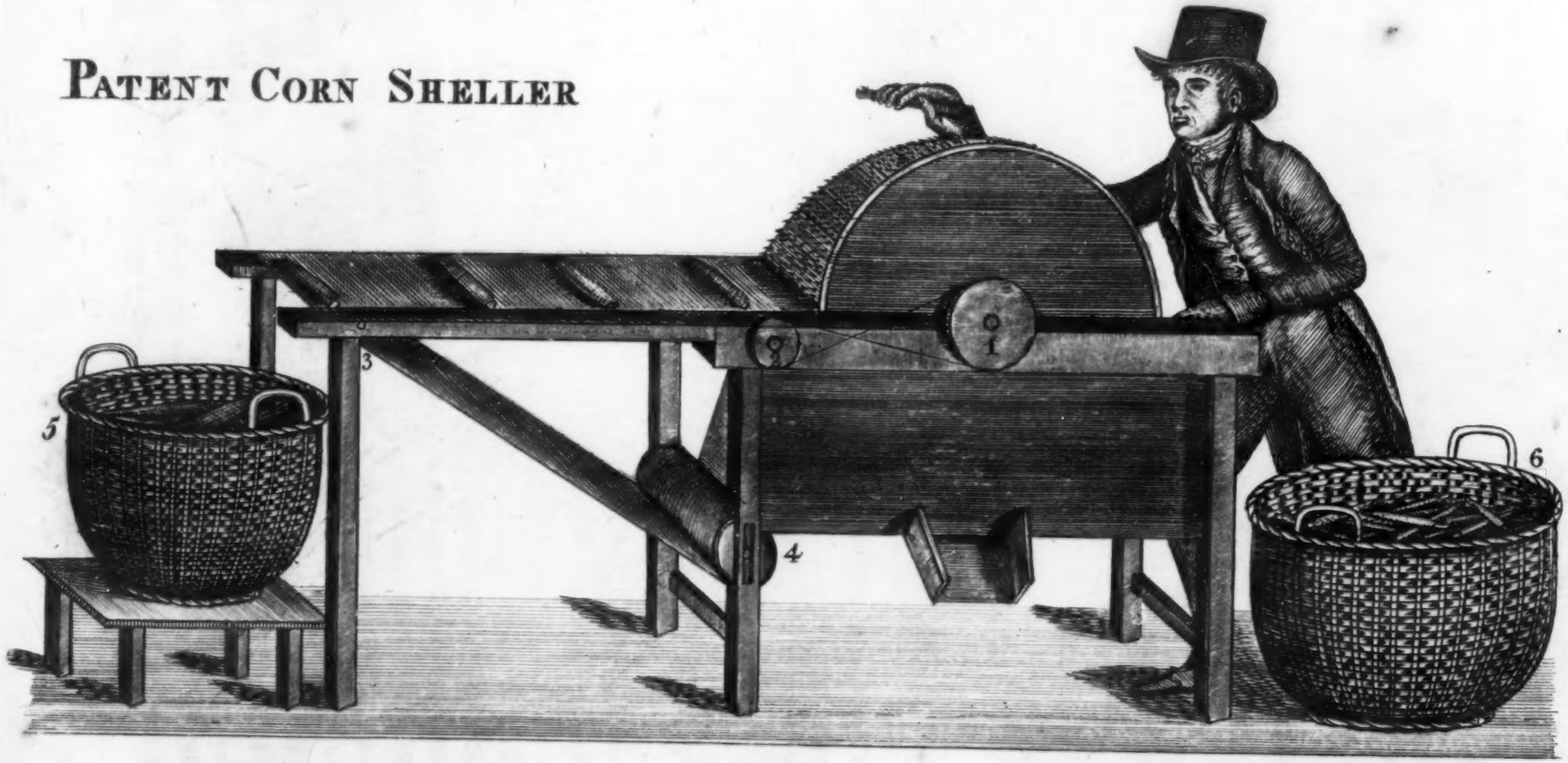
"A flat piece of wood placed at the top of the frame at one end to conduct the ears of corn in at one side of the Cylinder, which being shelled, the cobs pass out at the other side. The side where the ears enter is $\frac{1}{2}$ of an inch wider than that where the cob is discharged.

"Two men, with this machine, worked by hand, may shell one hundred bushels of corn in a day; the machine may also be fixed to be turned by water, or by a horse."

Though this machine is much more expeditious and effectual for shelling corn than any method before practised, and also combines many advantages for the public over the usual methods, such as that the corn must be sufficiently dry to be merchantable or it will clog the machine, and the machine will not break off the points of the cob to mix with the corn; yet it does not appear to have gone through the due course of experiment and observation, of a skillful Inventor to bring it to the degree of perfection of which it is capable.

The machines made in several parts of this state where the right has been sold for towns and counties, are liable to some or

PATENT CORN SHELLER



A.M. Peasley sc.

all of these objections *viz.*—an ear of corn which is of very irregular shape, if very large at the butt and small at the other end, will not be shelled clean, the gudgeon being loose in the mortice, and the clasp over the axle being left loose to accommodate the passage of different sized ears of corn, it will sometimes happen that an ear will stick between the slats of the tub so that the Cylinder must be taken out to clear it, if the slats are so close as at all times to prevent this difficulty, they will not permit the corn to discharge so fast as it is shelled; the fear of having the fingers caught when the corn is let in by hand will occasion the feeding irregularly, and if an ear goes in one end first it will break to pieces and clog the machine.

Improvements have been invented to obviate those objections by the proprietor of the machine in Boston, who has secured his right in the improvements, which are described as follows, *viz.* a feeding cloth by which a child of 7 years of age standing on a block by the basket of corn, fig. 5, may place on the ears by small pieces of wood at equal distances, fastened to the cloth, to prevent the corn rolling together, if the cloth should flag in its revolution; which is produced by the pullies 1, 2, with a cross band, revolving the small cylinders or rollers 2, 3, 4, over which the cloth is stretched, the roller 4, is loaded and plays on its pivots in a groove formed in the legs of the frame or attached to them by a cleat, the feeding frame is supported by hinges to the main frame, and by two legs with hinges near fig. 3.

When the machine is not in use, the legs of the feeding frame may be raised to the frame by hinges near 3, and the feeding frame let down by hinges near 2, close to the main frame.

That all the ears however irregular in shape may be shelled clean, the two latter staves or slats in the bottom next to where the cobs are discharged are pressed within the sweep of the bottom, by flat iron springs fastened to the center of each slat the other ends of the springs fastened to the cross board between the legs of the frame, the gutter in which the slats are confined being widened for those two, so that the whole slat or either end may be forced close to the cob.

The two slats at each end of the tub or bottom may be contiguous, of 4 or 5 inches width, the others narrower may be so far apart as freely to let the corn fall through, and in the edge of each slat three or more small irons crooked and pointed at one end, to be drove in lieu of teeth with an arm an inch in length extending over the next slat on which the ears will roll over the spaces.

These improvements which render the feeding more safe and regular, which clean all cobs more effectually and prevent the

clogging of the machine, and the consequent interruption of raising the cylinder to clear the tub.

5, In the plate represents the basket of corn, 6, the basket into which most of the cobs will fall, and when the man empties his basket of cobs in a heap and fills it with corn to set on the stool or bench, the child can move the empty basket to the place for receiving the cobs.

MATHEMATICS.

(Continued from Page 21.)

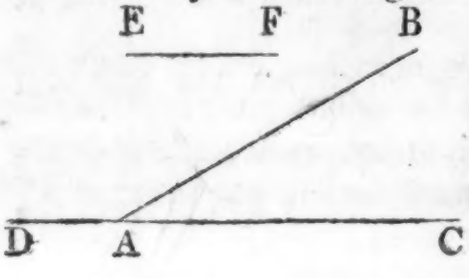
A military Engineer is directed to fortify a harbour, he determines to plant a battery on a point of land projecting into the harbour in the shape of an acute angle, but so as the point of the angle is not directly against the channel or anchoring ground which he means to annoy—but the point is given to which he intends to face his battery, and he desires to get as near the object as the ground will admit, the number and size of the guns for this post may be known in which case the length of his battery can be ascertained; in either case one of the following questions if practicable, will enable him to perform his duty to the best advantage.

Prop. 3d.

Can a line be drawn terminating in the sides of an angle less than a right angle, and in position so that it shall be at right angles with a line drawn from the required line to a given point, in a line produced from one of the sides beyond the angular point? i. e. Can a line be drawn between the sides C. A.—B. A. of the angle C. A. B. so that it shall be at right angles with a line drawn from any part thereof to the point D. in the line C. D. produced from the line C. A.?

Prop. 4th.

Can a line be drawn equal to a given line terminating in the sides of an angle less than a right angle, and in position so that it shall be at right angles with a line drawn from the center of the required line, to a given point in a line produced from one of the sides beyond the angular point?



i. e. Can a line be drawn terminating in the lines C. A.—B. A. which shall be equal to E. F. and at right angles with a line from its center to the point D.

TEMPERING EDGE TOOLS.

MESSRS. EDITORS,

THE art of hardening and tempering steel without risque for the various purposes, to which this most important of all metals is adapted, is so little understood even by many who work in it, that I presume a short communication on this subject would be acceptable to the readers of your *Useful Cabinet.* It often happens that tools, on which much labour has been bestowed, are spoiled in tempering, to the disappointment of the purchaser and to the discredit of the maker. The following directions, which by experience will be found to be correct, are designed to remedy these inconveniences. Should you think a correct knowledge of this art of importance to the mechanical part of the community, you will please to give it a place in your useful publication.

Admitting the tool has been properly forged without burning or injuring the steel, in order for a good temper, it should be carefully heated in a fire made with wood or charcoal till it is of a deep red colour, and then plunged into clean cold water in a perpendicular direction. If the temper is to be that of an edge tool, the steel must then be made bright, by grinding or scouring with a course stone and held over the fire until it is of a deep yellow or straw colour. This is the proper temper of edge tools, the most difficult part of which process is, to give the steel the least possible degree of even heat, to give it the greatest possible degree of hardness and strength. If the heat is continued beyond this exact degree, the pores of the steel will be so opened as to render it brittle with but a small degree of hardness, should the heat be carried beyond this degree by inattention, or accident, the evil will not be remedied by letting it cool down to this colour before it is cooled in the water; in this case it will be necessary to hammer the tool over again in order to settle the pores of the steel together. The greatest care should therefore be taken, in hardening a tool not to heat it too hot, as its goodness depends more on this circumstance than is apprehended. Care should also be taken that it does not remain in the fire after it has acquired a proper heat; as even without a greater degree of heat, the fire will soon coat it over with a thick scale, which will prevent the water from cooling it so quickly, as is necessary to render it as hard as possible.

Many small tools such as punches, broaches, &c. for clock and watch makers may be tempered by the simple process of heating as above directed, and cooling them in hot water, a little below boiling heat. This temper gives small tools great strength and a proper degree of hardness. Very small drills are best heated in

a candle with a blow pipe and cooled in tallow. Their temper is to be taken down the same as an edge tool. Tools, for turning iron and steel, receive a much greater degree of hardness by being cooled in quicksilver instead of water. This method of hardening must be valuable to clock and watch makers, as well as to many other mechanics, who want tools made as hard as possible.

The temper of a spring, after it is carefully hardened, is obtained by holding it over the fire with tallow on it until the tallow blazes and burns off; the burning of the tallow should be continued for a minute or two on those springs which from their use are liable to break. Small springs, and other articles to be tempered spring temper, are more conveniently tempered in a sheet-iron pan or case with tallow, held over the fire until it blazes, when it is to be taken off and carefully shaken while the tallow continues burning.

Saws and many other common tools which require a file to sharpen them, pinions and arbers in clocks and watches, Surgeon's instruments, *except those designed for cutting*, bayonets, sword blades, gun sticks, and various other articles are of this temper.

Iron may be hardened by the process of what is called case-hardening. This is performed by inclosing the iron in an air tight case with charcoal dust and a little salt, and heating the same red hot for one or two hours, and cooling it in clean cold water. The hammers and many other parts of gun locks are hardened in this manner. If the process is properly managed, iron and steel may be hardened without even altering the smooth surface of the instruments, the advantage of which is sufficient to induce the greatest attention in giving it the exact degree of heat. J.

IMPROVEMENT FOR RIVER BOATS.

Beckman professor of Economy in the University of Gottingen in his Chapter * entitled *Floating of Wood*, after relating the methods practiced in Europe of floating timber for building and for fuel in single logs down small rivers and then connecting them as the rivers became larger; observes, "It is probable that the most ancient mode of constructing vessels for the purpose of navigation gave rise to the first idea of conveying timber for building in the like manner; as the earliest ships or boats were noth-

* History of Inventions and Discoveries, translated from the German, by Wm. Johnson, London, printed for J. Bell, 1797. Vol. ii. page 312 and 323.

ing else than rafts, or a collection of beams and planks bound together, over which were placed deals. By the Greeks they were called *schedai*, by the Latins *rates*; and it is known from the testimony of many writers, that the ancients ventured out to sea with them on piratical expeditions as well as to carry on commerce; and that after the invention of ships they were still retained for the transportation of soldiers and of heavy burdens."

"The city of Paris had consumed all the wood in its neighbourhood, and the price of that article became enormous on account of the distance of forests and the expence of transporting it, John Rouvel, a citizen and merchant, in the year 1549 fell upon the plan of conducting wood bound together along rivers which were not navigable for large vessels; the success of this attempt soon gave rise to others, and canals were afterwards constructed in several places for the purpose of forming a communication between different rivers to convey floats. The French writers consider the transportation of large floats, trains de bois, as a great invention."

It does not appear in his Book that the learned and ingenious Professor knew that to this day in some parts of the world floats are in use very similar to those he describes of the earliest inventions. On the eastern coast of South America, from the line to San Salvador, the natives construct vessels of logs, six or more laid parallel and held together by cross pieces on the top, with trunnels through the logs, these logs are levelled on the top and sharpened at the ends, and the under sides seem to have been left in their natural shape, the logs are so placed that the ends are elevated above the general level of them, over these cross pieces are laid mats on which goods are transported on their rivers and along shores, they have a stepped mast easy to ship and unship, with a shoulder of mutton sail, one side of which is hooped to the mast and may be hoisted or lowered with great dispatch, having only a point up, the wind will make less obstruction to those operations; a light shifting boom fixes to the clue which may readily be taken out, and the sail brailed up to the mast, and are steered by a broad paddle, a guide board is let down between the logs close abaft the mast nearly in the center of the breadth which serves for a keel and keeps them up to the wind.

A model of one of these boats has been shewn to the Editors by a gentleman of talents and correct observation of this town, who has been several times on that coast and has seen them of different sizes, some large enough to carry twenty hogsheads or more, they are used for carriage of bales and all kind of merchandize, some of the smaller used by fishermen he has seen fifty or sixty miles from shore of 25 or 30 feet in length and without any

side boards, which however are occasionally placed to the larger floats, they are made of the trunks of the cabbage-tree, the most buoyant of any wood known, which in these countries grow very large, the advantage of these floats consist in this, that on approaching the shore by hoisting the guide board they run over flats and shoals quite up to the dry land, they are described as sailing very fast and holding a wind equal to a keel boat.

An idea arises from considering this float which may produce an essential improvement in flat bottom boats used in this country in our rivers and canals, these boats after leaving the narrow passes through which they descend by the current or the draft of men or horses, meet with much difficulty in passing over the broad water of harbours and bays, whenever the wind or tide is not favourable to their course, and are often unprovided with sails from the consideration that they would seldom be of any use.

Most of the boats in *Middlesex canal* are of about the following dimensions, and probably those in *Potomac* and other *canals* are nearly similar, viz. 50 or 60 feet in length, 10 feet breadth, and two and a half feet depth of side—with a long slant at each end, they are mostly governed by a clumsy long steering oar, traversing on the stern cross timber by an iron bolt passing thro' the timber, and they have a very broad paddle or blade—some of these boats, are steered in a much superior manner by a rudder and short tiller, the rudder is a strong plank raking under the stern, morticed or split at the bottom of a sufficient length to receive another plank or board, which is suspended at the inner end in the mortice by a bolt on which it freely traverses, the outer end is loaded sufficient to make it freely descend, and connected by a small chain to the upper end of the rudder, on a hook by which it is suspended, and may be raised or lowered at pleasure according to the depth of water. To make these boats more manageable in broad waters, it is proposed to have a strong beam across as high as the waist, at one third of the length from the stem or forward end of the boat, which should be a few inches wider than the stern, with a clasp to the beam to hold the mast; the mast may be between one third and one half the length of the boat, light and tapering considerably to the top, the boom two thirds the length of the mast; the sails of light cloth, the fore leach close hooped to the mast, the mast may rake aft so that the head may plum two feet or more abaft the foot.

A tight box or well room well caulked and secured, must be made in the center of the width of the boat, beginning close behind this beam, for receiving the guide board or temporary keel,

within which a hole four inches in width and three feet long must be made through the bottom of the boat thro' which the *guide board* or *keel* is to be let down, the guide board must be of strong stiff plank 6 or more feet in length, and $2\frac{1}{2}$ or 3 feet breadth 3 inches thick and may be slanted down to 1 and $\frac{1}{2}$ inches thickness at the lower end ; the planks of which the scuttle room is made should be strong, so that bolts may be placed thro' them to keep the keel steady, and to connect with them some simple manner of hoisting out the keel when necessary. The expence of making an experiment of this proposed improvement, would be trivial to any corporation, compared with the advantages they would derive from the improvement, if as is expected, it should be successful. W.

MESSRS. EDITORS,

The nature of friction and the method of diminishing its effects in machinery being but little understood by artists generally in this country, it is presumed that the following observations extracted from Ferguson's Lectures, *will be both highly gratifying and useful to them—you will therefore oblige many of your friends by re-printing them in your* Useful Cabinet.

ON THE NATURE OF FRICTION AND THE METHOD OF DIMINISHING ITS EFFECTS IN MACHINERY.

"THE resistance which friction generates in the communicating parts of machinery is so powerful, and the consequent defalcation from the impelling power is so great, that a knowledge of its nature and effects must be of the highest importance to the philosopher and the practical mechanic. The theory of machines must continue imperfect till the nature and effects of friction are thoroughly developed, and their performance must be comparatively small, and the expence of their erection and preservation comparatively great, till some effectual method be discovered for diminishing that retardation of the machine's velocity, and that decay of its materials which arise from the attrition of the connecting parts. The knowledge, however, which has been acquired concerning this abstruse subject has not been commensurate with the labours of philosophers, and the progress of other branches of mechanical science ; and those contrivances which ingenious men have discovered for diminishing the resistance of friction, have either been overlooked by practical in-

quirers, or rejected by those vulgar prejudices which prompt the mechanics of the present day to persist in the most palpable errors, and neglect such maxims of construction as are authorized both by theory and experience.

M. Amontons was the first philosopher who favoured us with any thing like correct information upon this subject. He found that the resistance opposed to the motion of a body upon a horizontal surface was exactly proportional to its weight, and was equal to *one third* of it, or more generally to one third of the force with which it was pressed against the surface over which it moved. He discovered also that this resitance did not increase with an increase of the rubbing superficies, nor with the velocity of its motion.

The experiments of M. Bulfinger authorized conclusions similar to those of Amontons, with this difference only, that the resistance of friction was equal only to *one fourth* of the force with which the rubbing surfaces were pressed together.

This subject was also considered by Parent, who supposed that friction is occasioned by small spherical eminences in one surface being dragged out of corresponding spherical cavities in the other, and proposed to determine its quantity by finding the force which would move a sphere standing upon three equal spheres. This force was found to be to the weight of the sphere as 7 to 20, or nearly one third of the sphere's weight.—In investigating the phenomena of friction, M. Parent placed the body upon an inclined plane, and augmented or diminished the angle of inclination till the body had a tendency to move, and the angle at which the motion commenced, he called the angle of equilibrium. The weight of the body, therefore, will be to its friction upon the inclined plane as radius to the sine of the angle of equilibrium, and its weight will be to the friction on a horizontal plane, as radius to the tangent of the angle of equilibrium.

Mr. Ferguson found that the quantity of friction was always proportional to the weight of the rubbing body, and not to the quantity of surface, and that it increased with an increase of velocity, but was not proportional to the augmentation of celerity. He found also that the friction of smooth soft wood, moving upon smooth soft wood, was equal to $\frac{1}{3}$ of the weight; of rough wood upon rough wood $\frac{1}{2}$ of the weight; of soft wood upon hard, or hard upon soft, $\frac{1}{5}$ of the weight; of polished steel upon polished steel or pewter $\frac{1}{4}$ of the weight; of polished steel upon copper $\frac{1}{3}$, and of polished steel upon brass $\frac{1}{6}$ of the weight.

(To be continued.)

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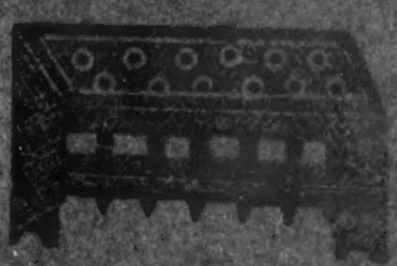

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